

## **Panel Discussion: Public Issues/Concerns Regarding Microbial Biological Control**

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### **Perceptions of risk with microbial biocontrol agents (whether true or false).**

A Canadian national telephone survey on the public perception of biological control was conducted in 1995 which included 1,000 people surveyed (McNeil et al., 2010, BioControl 55, 445-454). While over 80% were interested in the environment, only 55% considered themselves well versed in biological control. Younger (<24) and older (>65) people were less concerned about food safety than people between ages of 25 and 64 as well as women overall. The majority believed that organically produced foods, or those protected with biological control, were safer than those produced using synthetic insecticides. However, 25% of respondents considered biological control as more environmentally harmful than synthetic insecticides. There was a direct relationship between support for biological control, and their level of concern over food safety and level of education, with those with higher education showing more support. However, when the question included the term “beneficial microbes”, 45% expressed concern about the safety of the food thus treated. Over 80% of respondents expressed that food products treated with biological control should be labeled to reflect this. The authors concluded that the public has a number of misconceptions about biological control and that the results underline the need for appropriate outreach activities to educate the public on the strengths and limitations of biological control in pest management.

In my experience, there is no doubt that the public has some degree of pathophobia. An example is the public hysteria demonstrated during the applications of Bt over urban areas (Vancouver & Victoria) against an eradication program of the introduced Asian gypsy moth. One of the first questions I receive after a presentation on microbial control is regarding mutations. This is regardless of the level of education of the audience, other than of course scientists involved in microbial control. There is a great misunderstanding of microorganisms and their ability to mutate into some uncontrollable monsters, wiping out populations, not only of invertebrates, but also mammals, including man. I believe that this stems from the fact that we are reminded yearly that last year's influenza virus has now mutated and thus we require re-immunization. The other is a misunderstanding of the fact that these microorganisms already exist and are an important factor in the natural regulation of invertebrate populations. The majority of micro-organisms are beneficial and only a few are detrimental.

### **Examples of negative effects: disruption of food webs, competitive displacement, indirect effects of microbial agents**

Whenever any population is altered, it will have some consequence on the ecosystem, be it negative or positive. The consequences of using fast acting insecticides are quite apparent, because a large proportion of a population or populations are eliminated sometimes within hours. Permanent direct or indirect damage could be possible if an exotic agent were to establish and provide long-term control of a host. However, I am not aware of any examples of detrimental ecological effects from deliberate

introductions of microorganisms for use in “classical” control, however to date; there are only a very limited number of introductions that have been made.

Indigenous microorganisms are usually used inundatively. Although direct impacts on non-target invertebrates closely related to the target host are common, there is no evidence to suggest that these pathogens become established in the non-targets, thereby causing long-term effects. Even if an indigenous organism were to be used, the effect would almost invariably be short-lived; the negative effect, if any, would almost invariably be eliminated in time one the microbial is no longer applied. I believe there is a great misconception that inundative use of an indigenous organism would result in a host jump, with possible permanent establishment within a non-target population. I say this because I cannot understand the need for the array of non-target host testing required of regulatory agencies for registration of indigenous organisms. When evaluating the risk posed by an indigenous microorganism, it is important to include in the risk analysis the alternatives of not controlling the pest or the effects of broad spectrum insecticides.

### **Predicting unintended interactions/Non-target effects in field**

I argue that little useful information is to be gained from extensive laboratory testing of indigenous microorganisms for their effects on non-target organisms. Such testing does not necessarily provide an indication of safety and inundative use of an indigenous pathogen is essentially no different to using a chemical insecticide. Unintended interactions or non-target effects are best studied under field conditions, especially under commercial IPM programs; let the user determine how the microbial best fits into his or her IPM strategy. Extensive laboratory testing of non-indigenous microorganisms also does not necessarily provide useful information; much more pertinent information would be gained by studying its ecology in its native habitat. Bottom line is that the best way to determine effects of indigenous organisms is to start using them.

### **Positive effects of microbial control: What’s gone right? Benefits of microbial biocontrol in mitigation of ecosystem disruption, species loss, ecosystem restoration, etc**

With the exception of Bt, most microbials have only recently been registered for use in Canada. However, much research has indicated that microbials have a very important and useful role in integrated pest management especially within greenhouses. Because most greenhouses are already fully dependent on biological control using macrobials (predators & parasitoids), use of chemical insecticides is not possible as they totally disrupt the macrobials. In contrast, microbials can be used effectively to quickly depress a pest outbreak with minimal damage to the macrobials. However, it has also been demonstrated that if pest management relies exclusively on one method (i.e. the bacterium Bt), resistance is imminent.

There are numerous examples world-wide of what has gone right, from use of viruses to control codling moths in Europe and velvetbean caterpillars in Brazil to the devastation of the introduced gypsy moth in the USA by the fungus, *Entomophaga maimaiga*. In the southern US states, conservation of naturally occurring fungal epizootics can reduce insecticide applications against aphids in cotton. Most successful examples come from countries where regulatory hurdles have been minimal or non-existent.